AMENDMENTS TO THE CLAIMS

Claims 1-12 (Canceled)

Claim 13 (Currently Amended): An apparatus ~~turbo decoder having a state metric,~~ comprising:

a turbo decoder having a state metric, the turbo decoder including:

branch metric calculation means for calculating a branch metric by receiving symbols through an input buffer;

state metric calculation means for calculating a reverse state metric by using the calculated branch metric at said branch metric calculating means, storing the reverse state metric in a memory, calculating a forward state metric; and

log likelihood ratio calculat~~ion means~~or for calculating a log likelihood ratio result by receiving the forward state metric from said state metric calculation means and reading the reverse state metric saved at a memory in said state metric calculation means,

wherein the log likelihood ratio result L_k is ~~calculated by using an equation~~ produced by computing a function $\underset{m-0}{\overset{2^{v}-1}{E}}(A_k^{1,m}+B_k^{s(m)}) - \underset{m-0}{\overset{2^{v}-1}{E}}(A_k^{0,m}+B_k^{m})$ by the log likelihood ratio calculator, wherein m is a state of a trellis diagram; k is a stage; $s(m)$ is a function a number complemented a Most Significant Bit(MSB)of binary number of m; $\underset{j-0}{\overset{1}{E}}$ is a function defined as $\underset{j=0}{\overset{1}{E}} A_k^{j} = A_k^{0}\, E\, A_k^{1} = log_e(e^{A_k^0}+e^{A_k^1})$; j is a $(k-1)^{th}$ input for a reverse state metric; $A_k^{1,m}$ is a k^{th} forward state metric with state m and input 1; $B_k^{s(m)}$ is a k^{th} reverse state metric with state $s(m)$; $A_k^{0,m}$ is a k^{th} forward state metric with state m and input 0 and B_k^{m} is a k^{th} reverse state metric with state m, and the log likelihood ratio is stored in a memory of the turbo decoder.

Claim 14 (Currently Amended): The ~~turbo decoder~~apparatus ~~in recited as~~of claim 13, wherein said state metric calculation means includes:

reverse state metric calculation means for calculating a reverse state metric in case an input i is 0 according to states of the branch metric; and

forward state metric calculation means for calculating a forward state metric in case an input i is 0 or in case the input i is 1 according to states of the branch metric.

Claim 15 (Currently Amended): A ~~calculation~~ method ~~implemented to a turbo decoder,~~ comprising~~ steps of~~:

~~a)~~calculating a branch metric by receiving symbols;

~~b)~~calculating a reverse state metric in case an input i is 0 by using the calculated branch metric and saving the calculated reverse state metric in a memory;

~~c)~~calculating a forward state metric in case an input i is 0 or in case the input i is 1 by using the calculated branch metric;

~~d)~~calculating a log likelihood ratio by using the forward state metric and the reverse state metric; and

~~e)~~storing the log likelihood ratio,

wherein the log likelihood ratio result L_k is produced by computing a function ~~calculated by using an equation~~ $\underset{m-0}{\overset{2^v-1}{E}}(A_k^{1,m}+B_k^{s(m)}) - \underset{m-0}{\overset{2^v-1}{E}}(A_k^{0,m}+B_k^{m})$~~-~~by a first calculator, wherein m is a state of a trellis diagram; $s(m)$ is a function provides a number complemented a Most Significant Bit (MSB) of binary number of m; $\underset{j-0}{\overset{1}{E}}$ is a function defined as $\underset{j=0}{\overset{1}{E}} A_k^j = A_k^0 \, E \, A_k^1 = log_e(e^{A_k^0} + e^{A_k^1})$;$j$ is a $(k\text{-}1)^{th}$ input for a reverse state metric; k is a stage; $A_k^{1,m}$ is a k^{th} forward state metric with state m and input 1; $B_k^{s(m)}$ is a k^{th} reverse state metric with state $s(m)$; $A_k^{0,m}$ is a k^{th} forward state metric with state m and input 0 and B_k^m is a k^{th} reverse state metric with state m.

Claim 16 (Currently Amended): The ~~calculation~~ method ~~as recited in~~of claim 15, wherein the reverse state metric result B_k^m, which is k^{th} reverse state metric with state *m*, is produced by computing a function ~~calculated by using an equation~~ $\mathop{E}\limits_{j=0}^{1}(B_{k+1}^{F(j,m)} + D_{k+1}^{j,f(m)})$ by a second calculator, wherein *m* is a state of a trellis diagram; *k* is a stage; *j* is a $(k\text{-}1)^{th}$ input for a reverse state metric; *f(m)* is the state of $(k+1)^{th}$ stage related to *the state m of* k^{th} stage; *F(j,m)* is a function defined as *F(j,m)=f(m)* for *j=0* and *F(j,m) = s(f(m))* for *j=1; s(m)* is a function provides a number complemented for a Most Significant Bit (MSB) of binary number of m; $\mathop{E}\limits_{j=0}^{1}$ is a function defined as $\mathop{E}\limits_{j=0}^{1} A_k^j = A_k^0 \, E \, A_k^1 = log_e(e^{A_k^0} + e^{A_k^1})$; $B_{k+1}^{F(j,m)}$ is a $(k+1)^{th}$ reverse state metric with state *F(j,m)* and $D_{k+1}^{j,f(m)}$ is *(k+1)th* branch metric with state *m* and $(k+1)^{th}$ input.

Claim 17 (Currently Amended): The ~~calculation~~ method ~~as recited in~~of claim 15, wherein the forward state metric result A_k^m, which is k^{th} forward state metric with state *m*, is ~~calculated by using an equation~~produced by computing a function $\mathop{E}\limits_{j=0}^{1}(D_k^{j,b(j,m)} + A_{k-1}^{b(j,m)})$ by a second calculator, wherein *m* is a state of a trellis diagram; *k* is a stage; *b(j,m)* is the reverse state of the $(k\text{-}1)^{th}$ stage; *j* is a $(k+1)^{th}$ input for a reverse state metric; $\mathop{E}\limits_{j=0}^{1}$ is a function defined as $\mathop{E}\limits_{j=0}^{1} A_k^j = A_k^0 \, E \, A_k^1 = log_e(e^{A_k^0} + e^{A_k^1})$; $A_{k-1}^{b(j,m)}$ is a $(k\text{-}1)^{th}$ forward state metric with state *b(j,m)*and $D_k^{j,b(j,m)}$ is k^{th} branch metric with state *b(j,m)*.

Claim 18 (Currently Amended): The ~~calculation~~ method ~~as recited in~~of claim 15, wherein the reverse state metric result B_k^m, which is k^{th} reverse state metric with state *m*, is ~~calculated by using an equation~~produced by computing a function $\mathop{2}\limits_{j=0}^{1}(B_{k+1}^{F(j,m)} + D_{k+1}^{j,f(m)})$ by a second calculator, wherein *m* is a state of a trellis diagram; *k* is

a stage; j is a $(k\text{-}1)^{th}$ input for a reverse state metric; $f(m)$ is a state of $(k+1)^{th}$ stage related to k^{th} state with state m; $F(j,m)$ is a function defined as $F(j,m)=f(m)$ for $j=0$ and $F(j,m) = s(f(m))$ for $j=1$; $s(m)$ is a function provides a number complemented for a Most Significant Bit (MSB) of binary number of m; $\overset{1}{\underset{j=0}{2}}$ is a function defined as

$\overset{1}{\underset{j=0}{2}} A_k^j = A_k^0 \, 2 \, A_k^1 = log_2(2^{A_k^0} + e^{A_k^1})$; $B_{k+1}^{F(j,m)}$ is a $(k+1)^{th}$ reverse state metric with state $F(j,m)$ and $D_{k+1}^{j,f(m)}$ is $(k+1)th$ branch metric with state m and $(k+1)^{th}$ input.

Claim 19 (Currently Amended): The~~ calculation~~ method ~~as recited in ~~<u>of </u>claim 15, wherein the forward state metric <u>result </u>A_k^m, which is k^{th} forward state metric with state m, is ~~calculated by using an equation~~<u>produced by computing a function</u> $\overset{1}{\underset{j=0}{2}} (D_k^{j,b(j,m)} + A_{k-1}^{b(j,m)})$ <u>by a second calculator, </u>wherein m is a state of a trellis diagram; k is a stage; $b(j,m)$ is a $(k\text{-}1)^{th}$ reverse state; j is a $(k+1)^{th}$ input for a reverse state metric; $\overset{1}{\underset{j=0}{2}}$ is a function defined as $\overset{1}{\underset{j=0}{2}} A_k^j = A_k^0 \, 2 \, A_k^1 = log_2(2^{A_k^0} + 2^{A_k^1})$; $A_{k-1}^{b(j,m)}$ is a $(k\text{-}1)^{th}$ forward state metric with state $b(j,m)$and $D_k^{j,b(j,m)}$ is k^{th} branch metric with state $b(j,m)$.

Claim 20 (Currently Amended): ~~The~~<u> A</u> ~~calculation~~ method ~~as recited in claim 15~~<u>comprising:</u>~~,~~

<u>calculating a branch metric by receiving symbols;</u>

<u>calculating a reverse state metric in case an input i is 0 by using the calculated branch metric and saving the calculated reverse state metric in a memory;</u>

<u>calculating a forward state metric in case an input i is 0 or in case the input i is 1 by using the calculated branch metric;</u>

<u>calculating a log likelihood ratio by using the forward state metric and the reverse state metric; and</u>

<u>storing the log likelihood ratio,</u>

-wherein the log likelihood ratio result L_k is produced by computing~~calculated by using an equation~~a function $\sum_{m=0}^{2^v-1}(A_k^{1,m}+B_k^{s(m)})$ - $\sum_{m=0}^{2^v-1}(A_k^{0,m}+B_k^{m})$ by a calculator, wherein m is a state of a trellis diagram; k is a stage; $s(m)$ is a function provides a number complemented for a Most Significant Bit (MSB) of binary number of m; $\sum_{j=0}^{1}$ is a function defined as $\sum_{j=0}^{1} A_k^j = A_k^0 \sum A_k^1 = log_2(2^{A_k^0}+2^{A_k^1})$; $A_k^{1,m}$ is a k^{th} forward state metric with state m and input 1; j is a $(k\text{-}1)^{th}$ input for a reverse state metric; $B_k^{s(m)}$ is a k^{th} reverse state metric with state $s(m)$; $A_k^{0,m}$ is a k^{th} forward state metric with state m and input 0 and B_k^m is a k^{th} reverse state metric with state m.

Claim 21 (Previously Presented): A computer-readable recording medium storing instructions for executing a calculation method implemented to a turbo decoder, comprising functions of:

calculating a branch metric by receiving symbols;

calculating a reverse state metric in case an input i is 0 by using the calculated branch metric and saving the calculated reverse state metric in a memory;

calculating a forward state metric in case an input i is 0 or in case the input i is 1 by using the calculated branch metric;

calculating a log likelihood ratio by using the forward state metric and the reverse state metric; and

storing the log likelihood ratio,

wherein the log likelihood ratio L_k is calculated by using an equation $\underset{m=0}{\overset{2^v-1}{E}}(A_k^{1,m}+B_k^{s(m)})$ - $\underset{m=0}{\overset{2^v-1}{E}}(A_k^{0,m}+B_k^{m})$ wherein m is a state of a trellis diagram; k is a stage; j is a $(k\text{-}1)^{th}$ input for a reverse state metric; $s(m)$ is a function provides binary number of m with a most significant bit complemented; $\underset{j=0}{\overset{1}{E}}$ is a function defined as

$\overset{1}{\underset{j=0}{E}} A_k^j = A_k^0 \, E \, A_k^1 = log_e(e^{A_k^0} + e^{A_k^1})$; $A_k^{1,m}$ is a k^{th} forward state metric with state m and input 1; $B_k^{s(m)}$ is a k^{th} reverse state metric with state $s(m)$; $A_k^{0,m}$ is a k^{th} forward state metric with state m and input 0 and B_k^m is a k^{th} reverse state metric with state m.

Claim 22 (Previously Presented): The computer-readable recording medium as recited in claim 21, wherein the log likelihood ratio L_k is calculated by using an equation $\overset{2^v-1}{\underset{m=0}{2}} (A_k^{1,m} + B_k^{s(m)}) - \overset{2^v-1}{\underset{m=0}{2}} (A_k^{0,m} + B_k^m)$ wherein m is a state of a trellis diagram; k is a stage; j is a $(k\text{-}1)^{th}$ input for a reverse state metric; $s(m)$ is a function provides binary number of m with a most significant bit complemented; $\overset{1}{\underset{j=0}{2}}$ is a function defined as

$\overset{1}{\underset{j=0}{2}} A_k^j = A_k^0 \, 2 \, A_k^1 = log_2(2^{A_k^0} + 2^{A_k^1})$; $A_k^{1,m}$ is a k^{th} forward state metric with state m and input 1; $B_k^{s(m)}$ is a k^{th} reverse state metric with state $s(m)$; $A_k^{0,m}$ is a k^{th} forward state metric with state m and input 0 and B_k^m is a k^{th} reverse state metric with state m.

Claim 23 (Previously Presented): The turbo decoder having a state metric as recited in claim 13, wherein the log likelihood ratio L_k is calculated by using an equation $\overset{2^v-1}{\underset{m=0}{2}} (A_k^{1,m} + B_k^{s(m)}) - \overset{2^v-1}{\underset{m=0}{2}} (A_k^{0,m} + B_k^m)$ wherein m is a state of a trellis diagram; k is a stage; j is a $(k\text{-}1)^{th}$ input for a reverse state metric; $s(m)$ is a function provides binary number of m with a most significant bit complemented; $\overset{1}{\underset{j=0}{2}}$ is a function defined as

$\overset{1}{\underset{j=0}{2}} A_k^j = A_k^0 \, 2 \, A_k^1 = log_2(2^{A_k^0} + 2^{A_k^1})$; $A_k^{1,m}$ is a k^{th} forward state metric with state m and input 1; $B_k^{s(m)}$ is a k^{th} reverse state metric with state $s(m)$; $A_k^{0,m}$ is a k^{th} forward state metric with state m and input 0 and B_k^m is a k^{th} reverse state metric with state m.